

B759U, Burroughs Wellcome) has shown promise in the treatment of this infection.

Most patients who have been treated with BW B759U on a compassionate protocol basis have responded to treatment. Treatment does not restore lost vision but does halt the progress of infection into visually important structures, including the macula and optic nerve. The drug does not eradicate infection, and reactivation of disease is common following cessation of therapy. Recurrences develop at the borders of old lesions, indicating the persistence of live virus in the eye despite treatment. Therefore, it is necessary to maintain patients on continued therapy, which is complicated by the fact that the drug can only be administered intravenously. BW B759U is currently undergoing a multicenter randomized trial to evaluate further its efficacy and safety in the management of CMV retinopathy in AIDS.

Other intraocular infections in AIDS patients (ocular toxoplasmosis, cryptococcosis, mycobacteriosis and histoplasmosis) are uncommon, but may be the first manifestation of disseminated, tissue-invasive infections elsewhere in the body.

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Approaches to Surgical Repair of Adult Strabismus

STRABISMUS (ocular misalignment) is often thought of as a problem limited to infants and children. Actually, adult strabismus is relatively common, occurring in about 1% of the general population. Adult strabismus can be the result of persistent childhood strabismus or can be caused by cranial nerve palsies, thyroid disease, trauma to the orbit or eyeball, a periocular operation or loss of vision—that is, through cataracts or trauma. Patients with acquired strabismus should be evaluated for the possibility of a neurologic disease such as myasthenia gravis, progressive external ophthalmoplegia and cranial nerve palsies. A helpful distinguishing feature between acquired and infantile strabismus is the presence of diplopia. Infants and children (birth to 10 years of age) have a high degree of central nervous system plasticity and are able to develop a suppression mechanism that prevents diplopia throughout life. Adults, however, are unable to suppress, and acquired strabismus in adulthood inevitably results in diplopia.

A common misconception is that strabismus in adulthood is difficult or even impossible to treat. With recent advances in medicine, however, adults with strabismus actually have better treatment options than do children. One of the most recent innovations in the treatment of adult strabismus is the use of botulinum toxin injections (see the epitome on botulinum toxin for details). During the period of induced paralysis, which lasts about six to eight weeks, the antagonist muscle undergoes a secondary contraction. The transient paralysis wears off, but a persistent change in the antagonist muscle occurs, thus producing a change in eye position. This

form of therapy requires only a topical anesthetic and is very useful in patients with small-angle deviations and in patients with a high anesthesia risk.

Another treatment modality that is extremely useful in adults is the adjustable suture technique. This surgical procedure allows the surgeon to change the eye position in the immediate postoperative period while the patient is fully awake. The operation is done in two stages. In the first stage, the extraocular muscle is secured and placed on a suture in such a way that the muscle location can be changed the following day when the patient is fully awake. The second phase of the procedure entails adjusting the position of the muscle so that the eyes are properly aligned. The adjustable suture technique is particularly useful in complicated strabismus cases, such as in the treatment of superior oblique palsies where the eyes can be misaligned vertically, horizontally and even torsionally. With the adjustable suture technique, there is a much better chance of straightening the eyes with one operation, rather than the multiple surgical procedures often associated with the correction of strabismus in adults.

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Treatment of Retinopathy of Prematurity

AS THE SURVIVAL RATE of low-birth-weight infants has increased, there has been a concurrent increase in the incidence of retinopathy of prematurity. This disorder is characterized by retinal vascular changes that occur during the first months of life, including arteriolar and venular dilatation and tortuosity, peripheral shunt formation and gliovascular proliferation into the vitreous body. These alterations often are minimal and regress in time, but they may progress and lead to cicatrix formation and total retinal detachment, sometimes called retrolental fibroplasia. Cicatricial retrolental fibroplasia develops in an estimated 2,100 infants a year in the United States.

Many types of therapy have been tried. The results of recently completed trials of prophylaxis with antioxidants (vitamin E) have been disappointing and surgical treatment of retinal detachment in advanced stages of retrolental fibroplasia generally has poor results. Because the vasoproliferative changes seen in retinopathy of prematurity are similar to those found in conditions related to retinal ischemia or hypoxia—such as diabetic retinopathy and sickle cell retinopathy—it has been postulated that therapy analogous to that found efficacious in these diseases might be of value in preventing progression of the retinopathy of prematurity. Ablation of ischemic retinal tissue in the acute phases of this disorder by cryotherapy has been postulated to improve oxygenation of surrounding retinal tissue and to reduce the vasoproliferative changes that lead to cicatrix formation. Cryotherapy and photocoagulation have been tested in many isolated, relatively uncontrolled trials of small sample size, leading to variable results and conclusions. Photocoagulation using either xenon arc or argon laser has proved technically

unfeasible and, in recent years, attention has been centered on cryoablation techniques.

Until recently, lack of a satisfactory working classification for acute retinopathy of prematurity has hampered understanding of the natural history of the disease, the risk factors for its progression and the efficacy of its treatment. The recently published *International Classification of Retinopathy of Prematurity* (ICROP) has led to the establishment of a randomized, prospective, controlled multicenter study of the safety and efficacy of ablative cryotherapy, permitting consistent identification of cases, enrollment at uniform stages of the disease and comparison of data from a large series of cases by observers at different locations. This protocol has recently been started under the auspices of the National Eye Institute (Multicenter Trial of Cryotherapy for Retinopathy of Prematurity) and, it is hoped, will answer many questions about this increasingly prevalent, potentially blinding disease of premature infants.

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Current Approach to Intractable Glaucoma

FILTERING OPERATIONS such as trabeculectomies and full-thickness scleral fistulizing procedures are currently used in the surgical management of glaucoma in patients who have failed to respond to maximal medical therapy and argon laser trabeculoplasties. These procedures will control the intraocular pressure in about 85% of patients with primary open-angle glaucomas. Unfortunately, the success rate of filtering procedures in patients with aphakic glaucomas, neovascular glaucomas, young patients and those with congenital glaucomas is poor, in most instances because the subconjunctival drainage area (bleb) is obliterated by scar tissue. In these patients, one method of modifying the healing process is the use of antimetabolites, such as 5-fluorouracil. A multicenter national trial is now studying the effectiveness of 5-fluorouracil as compared with the more traditional filtering operations in controlling intraocular pressure in these difficult-to-manage cases. 5-Fluorouracil (5 mg) is injected subconjunctivally 180° from the trabeculectomy site twice a day from day 1—the first day after the trabeculectomy—and then daily from day 8 to 14.

Another approach has been the use of setons. Certain types of setons allow the healing to progress naturally but limit contraction of the scar tissue as implantation of a solid plate acts to preserve a fluid reservoir. Scar tissue forms around the plate, but contraction of the scar tissue is restricted. Aqueous humor fills the cavity around the plate, forming a bleb, and percolates through the fibrous capsule to be absorbed by the surrounding vessels.

The principle of using a rigid device to maintain a bleb cavity in the region of the equator of the globe has been incorporated into the Schocket implant, the Krupin long tube valve and the Molteno implant. The Molteno implant consists of a long, thin silicone tube attached to a 13.5-mm diameter

round, rigid methyl-methacrylate plate. The plate is sutured to the outer scleral surface in the equatorial region of the globe so that the large bleb that forms lies within the muscle cone beneath Tenon's capsule. The thin silicone tube attached to the plate is cut to the correct length and introduced into the anterior chamber. A transient rise in the intraocular pressure occurs two to ten weeks' postoperatively. Histologic studies suggest that this transient reaction is inflammatory in nature, and with resolution of the inflammation, intraocular pressure returns toward normal and remains well controlled with minimal medication. Short-term results have been encouraging, with 85% of patients maintaining intraocular pressure below 22 mm of mercury.

The major initial complication following introduction of the Molteno tube into the anterior chamber was short-term hypotony. This problem has been overcome, however, by placing an absorbable ligature around the tube (which opens spontaneously in about 75% of cases after four weeks) or by using a valve that opens at 8 to 10 mm of mercury, as used by Krupin.

The current surgical approach to severe, intractable glaucoma by either trabeculectomy, 5-fluorouracil injections or implantation of setons that incorporate equatorial plates to maintain a bleb cavity has significantly increased the success rates in these difficult management cases.

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Ultraviolet Filtration and Light Damage

THE HUMAN LENS absorbs ultraviolet and deep blue light, and there is evidence that some of this energy alters proteins whose structure is critical to the transparency of the tissue. Over a lifetime, this process contributes to yellowing and hardening of the lens that, in extreme cases, becomes dense enough to interfere with vision and to be called a cataract.

Light that passes through the lens is absorbed in the retina and in the retinal pigment epithelium, a supportive tissue that functions, among other things, to phagocytize retinal waste products. This energy facilitates the formation of oxidative free radicals that damage the complex lipid membranes of the photoreceptors. These oxidized lipids are relatively indigestible and hasten the accumulation of lipid debris that clogs the retinal pigment epithelium of older eyes. In some eyes the overburdened retinal pigment epithelium breaks down, with resultant damage to the adjacent retina. This process appears to be a major factor in the development of age-related macular degeneration.

Very bright or sustained light exposure can also be damaging in the short term to photoreceptors and retinal pigment epithelium. Spending the day on a sunny beach or ski slope without sunglasses may be enough to cause a degree of cellular injury—and, the longer the exposure, the less easy it is for the visual cells to recover. The most damaging wavelengths for photic injury to the retina are in the ultraviolet and the blue end of the visible spectrum.

On the basis of these findings, the use of good-quality